Technical University of Mombasa

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING & CIVIL ECONOMICS
(KIHBIT)

EBE 3117 : HYDRAULICS I

SUPPLEMENTARY: EXAMINATIONS

SERIES: APRIL 2014

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. You should have the following for this paper
   - *Answer booklet*
   - *Calculator*
2. This paper consists of **FIVE** questions.
3. Answer any **THREE** Questions

*This paper consists of **3 PRINTED** pages*

QUESTION ONE

a) A certain liquid has a specific gravity of 13.6. Determine in SI units;
   (i) Its unit weight
   (ii) Its mass density
   (iii) Its mass of 1 litre of the liquid
   (iv) The volume of 1.5kg of the liquid

(12 marks)

b) Define the following terms
   (i) Surface tensions
   (ii) Capillarity
   (iii) Viscosity
   (iv) Dimension

(8 marks)

QUESTION TWO

a) Using usual notations, derive Bernoulli's equation **(12 marks)**

b) A jet of water from a 25mm nozzle is directed vertically upwards. Assuming that the jet remains circular and that it leaves the nozzle with a velocity of 12m/s , determine the velocity of the jet at a point 4.5m above the nozzle. **(8 marks)**

QUESTION THREE

a) Water flows through a pipe 200mm in diameter that is 20m long, with a velocity of 2m/s. Determine the head lost due ot friction using
   (i) Darcy's formula if $f = 0.01$
   (ii) Chezy's formula if $c = 50$ in SI units

(8 marks)

b) A siphon has a 75mm diameter and has its crest 1.8m above water level and is discharging into the atmosphere at a level 3.6m below the water level. The atmospheric pressure is equivalent to 10m of water. Neglecting losses due to friction, determine:
   (i) The velocity of flow
   (ii) The discharge
   (iii) The absolute pressure at crest level

(12 marks)

QUESTION FOUR

a) A sewer 0.6m diameter has a bed slope of 1:200 and chezy's 0:55.
   Determine;

(i)   The maximum velocity that can occur
(ii)   The maximum discharge that can occur

(10 marks)

b) A channel of trapezoidal section has side slopes of 45° and is conveying water at a rate of 1.27 m^3/s with a velocity of 0.78m/s. If the depth of flow is 0.75m and chezy's C= 66, determine
(i)   The base width
(ii)   The bed slope

(10   marks)

QUESTION FIVE

a) Water is flowing through a 0.9m long rectangular weir. The head causing flow is 75mm. Using Francis equation determine the discharge, assuming
(i)   No side contractions
(ii)   One side contraction
(iii)   Two side contractions

(12 marks)

b) A v-notch with a coefficient of discharge of 0.6 is discharging water at a rate of 0.41m^3/s under a head of 0.6m. Determine the angle of the notch.   **(4 marks)**

c) A trapezoidal notch having 0.8m base has sides inclined at 30° to the horizontal. If the head causing flow is 0.4m, determine the discharge.

(4 marks)